# An Electronic System for Monitoring Persons in Isolation or Quarantine

Richard Danila, Ph.D, M.P.H.

Acute Disease Investigation and Control Section

Minnesota Department of Health

February 24, 2005

#### Definitions of Isolation and Quarantine (I/Q)

#### Isolation

 Separation and restriction of movement and activities of ill persons with a contagious disease for the purpose of preventing disease transmission

#### Quarantine

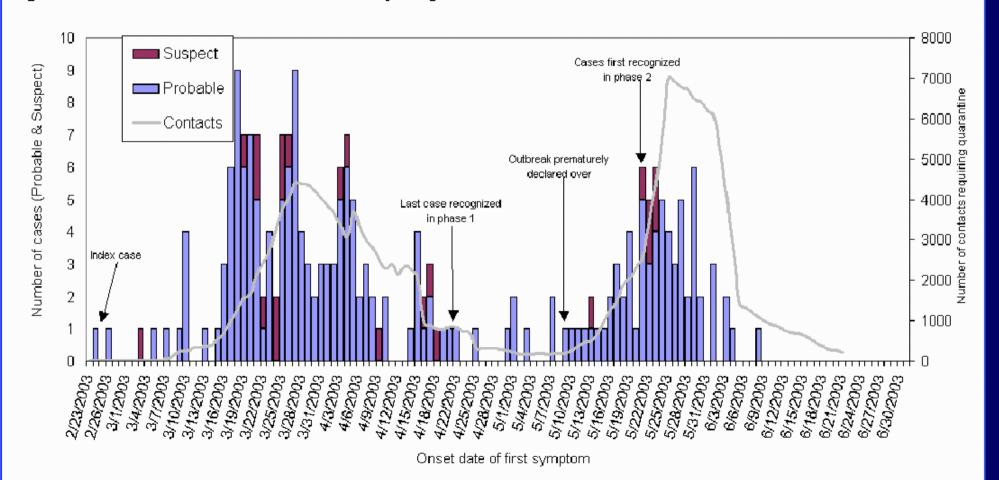
 Separation and restriction of movement and activities of persons who are not ill but are believed to have been exposed to infection for the purpose of preventing disease transmission

# I/Q Re-emergence as a Disease Control Strategy

- Bioterrorism concerns revitalized interest in I/Q
  - CDC sponsored draft of Model State Emergency Health Powers Act
  - In 2002 Minnesota Legislature updated old I/Q laws
- In response to Severe Acute Respiratory Syndrome (SARS) outbreak in 2003 several countries (Canada, Hong Kong, Singapore, and China) extensively used modern I/Q

# Number of Probable SARS Cases in Canada by Symptom Onset Date and Number of Persons in Quarantine February 23 to June 30, 2003 (N=249), excludes 1 case for whom onset date is unknown

Figure 1: Toronto SARS Cases\* Contacts Requiring Quarantine†



#### Quarantine for SARS, Ontario, 2003

- 23,297 contacts followed up
- Up to 7,000 persons in quarantine at any time
- Monitoring conducted through phone calls;
   1 or 2 calls per day
- Monitoring documented using a paper system

# **Ellis Island Quarantine Station**



# 21st Century Isolation/Quarantine Station



# I/Q Monitoring System: Need

- In September 2003, the Minnesota Department of Health (MDH) determined that a computerized monitoring system would be critical for managing large-scale I/Q for SARS
- Disease reporting is centralized in Minnesota but follow-up may occur at either the state or local level; the system must coordinate monitoring and assurance of essential services activities between state and local public health

#### Purpose of Monitoring Persons in I/Q

- Monitor the health status of persons in I/Q
- Ensure that persons in I/Q are compliant with restrictions
- Ensure that persons in I/Q have basic needs met (e.g., food, clothing, housing, medical needs, etc.)
- Ensure that persons in I/Q have appropriate infection control supplies

### I/Q Monitoring System: Goals

- Develop a system for monitoring persons in I/Q
- Flexibility
  - built on assumptions (e.g., number of days in I/Q may vary)
  - allow parameters to be updated as more information is gained
- Accommodate different diseases where I/Q may be implemented
- Creates automated reports

#### I/Q Monitoring System: Goals (cont.)

- Accommodate different levels of monitoring:
  - isolation
  - quarantine
  - monitoring without I/Q (e.g., person is monitored for symptom development but not placed in quarantine)
- Documentation for each person
  - communication with the individual
  - compliance with I/Q
  - essential service needs

- health status
- legal orders

# **Outline of Monitoring**

- Persons would be contacted twice daily; 3 phone attempts would be made
- If all 3 phone attempts fail, local public health will conduct a home check
- The following information needs would be collected during monitoring calls:
  - Temperature
  - New or worsening symptoms consistent with SARS
  - Symptomatic household contacts
  - Essential services needed

# **Monitoring Follow-up**

- If 3 phone attempts and home check fail the Medical/Legal Management Team will determine next steps
- If a person being monitored reports new or worsening symptoms, the Clinical Team will review to determine appropriate follow-up
- If services are needed and the monitored person is unable to obtain them, the request will be referred to local public health

#### **Primary Assumptions**

- Limited number of staff would be responsible for data entry and data management
- Other staff would view information on a specific person, but would not need to learn entire system
- System must provide information to and accept data from local public health agencies, since they would fulfill essential services and conduct some monitoring calls
- Monitoring calls could be documented on paper and then data entered into the application

#### **Development Process**

- Team of 11 IT staff and 3 epidemiologists
- Timeline: Initiated October 2003 with a goal of an operational system by December 2003

#### **Development Process (cont.)**

- System was developed, tested and implemented in a staged approach
  - Release 1: information essential to conducting monitoring if an outbreak occurred
  - Release 2: enhancements and web-based data entry (for local public health)
  - Release 3: legal order information and additional enhancements
  - Further enhancements considered (e.g., complete webbased system; disease specific enhancements for smallpox, novel influenza)

#### **Architecture**

- Developed a case-centered (i.e., person being monitored) system
- MS Access front-end was used for user interface
- Perl was used to generate reports
- Perl was used to create a delimited export file for epidemiologic analysis
- Java was used for web-based data entry
- Database was deployed in Oracle

# **Monitoring Data**

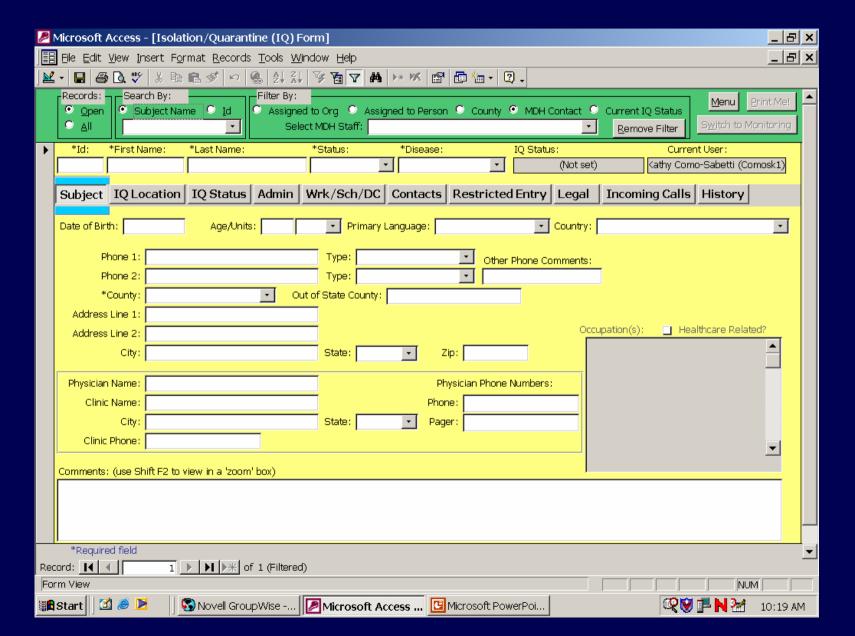
- Person information
- Contact information
- Work, school, and daycare information
- Orientation to I/Q call (Day zero)
- Monitoring calls
- Incoming calls from the person in I/Q or on their behalf
- Symptoms
- Service needs
- Court order information
- Restricted entry information

#### Reports

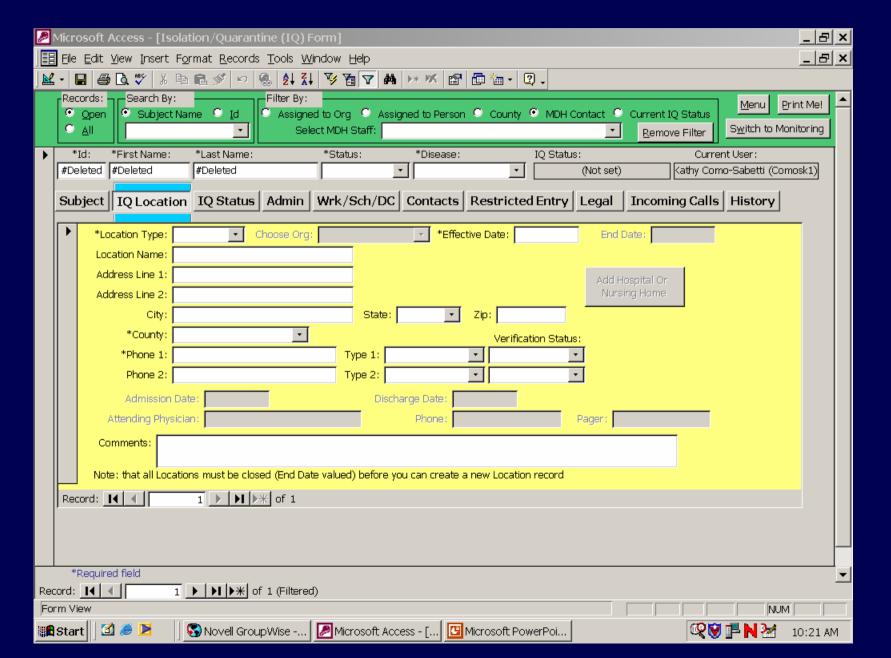
- The system generates 9 daily reports
- Internal reports "flag" persons who require followup or further evaluation (e.g., non-compliance, new or worsening symptoms)
- Local public health receives reports of:
  - all persons in I/Q in their jurisdiction
  - daily calls needed to be made (if local public health is responsible for monitoring)
- Communication with local public health
  - Initial release reports communicated via fax/phone
  - Future release reports communicated via encrypted file

# Isolation/Quarantine Monitoring System: Screens

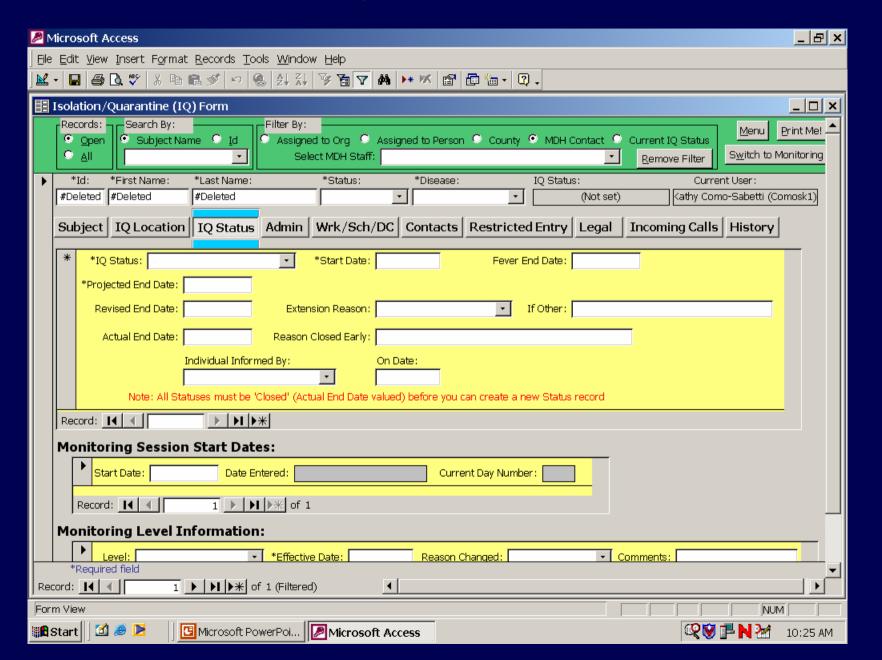
### Subject



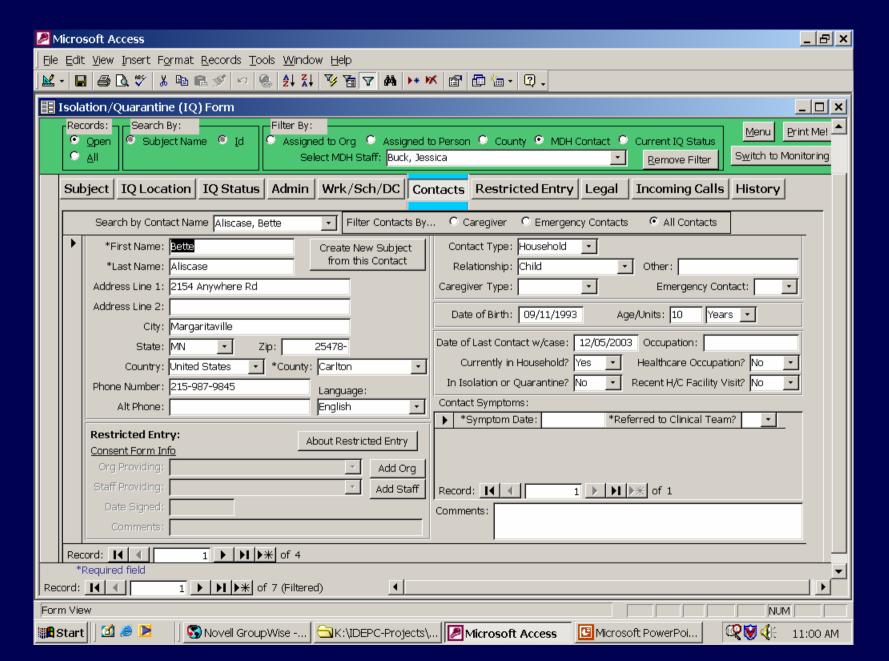
#### Isolation/Quarantine Location



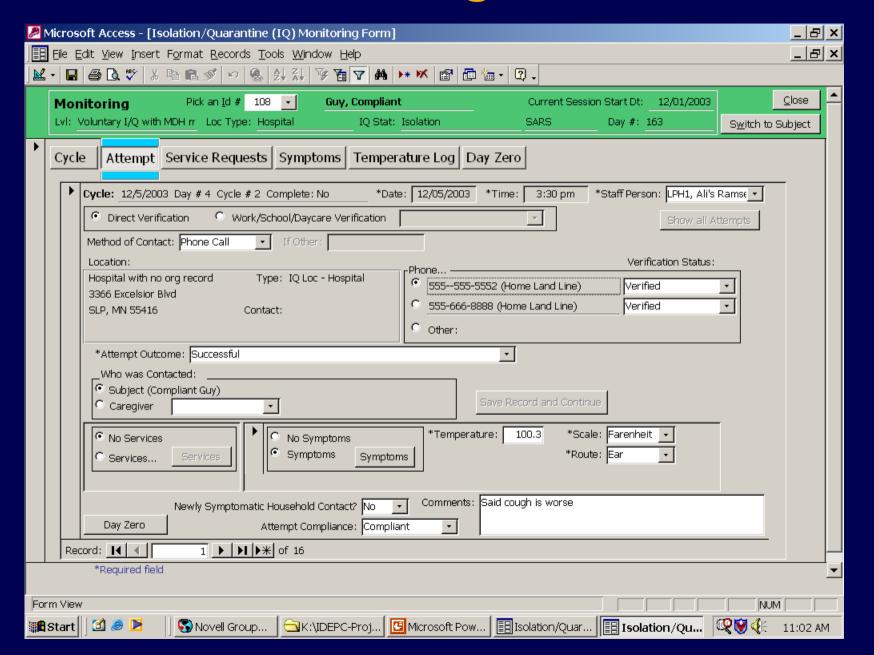
#### **Isolation/Quarantine Status**



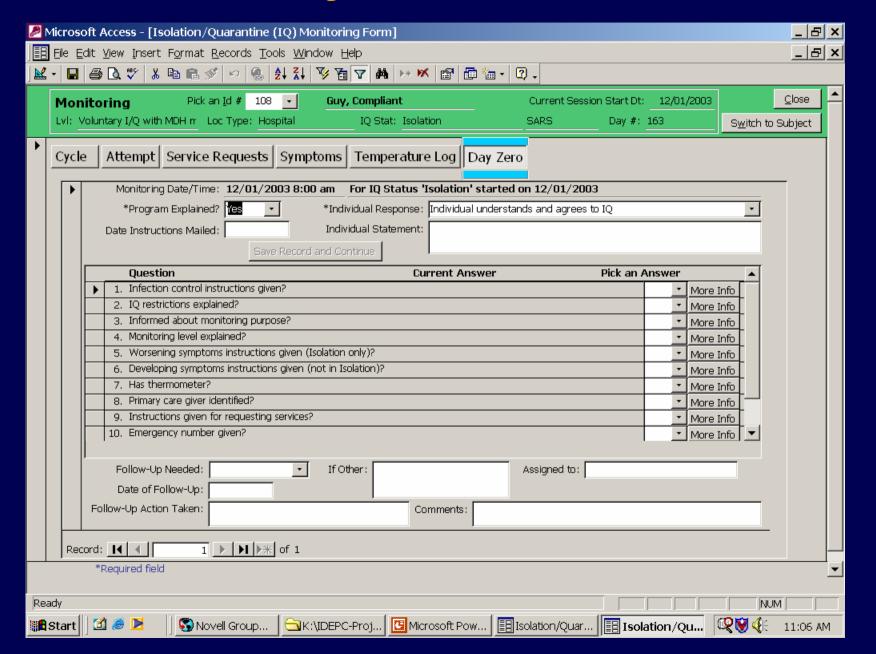
#### **Contacts**



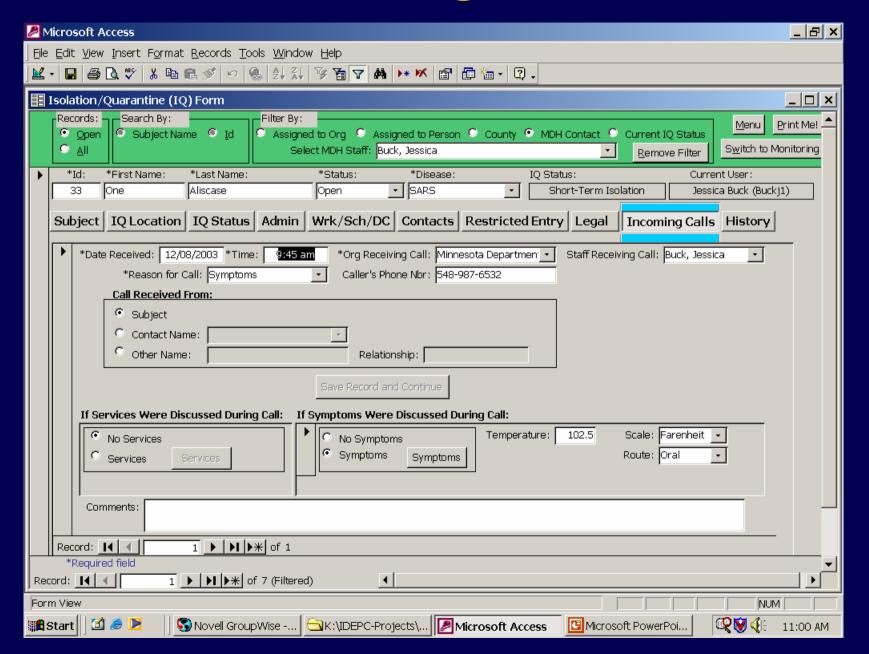
#### **Monitoring Calls**



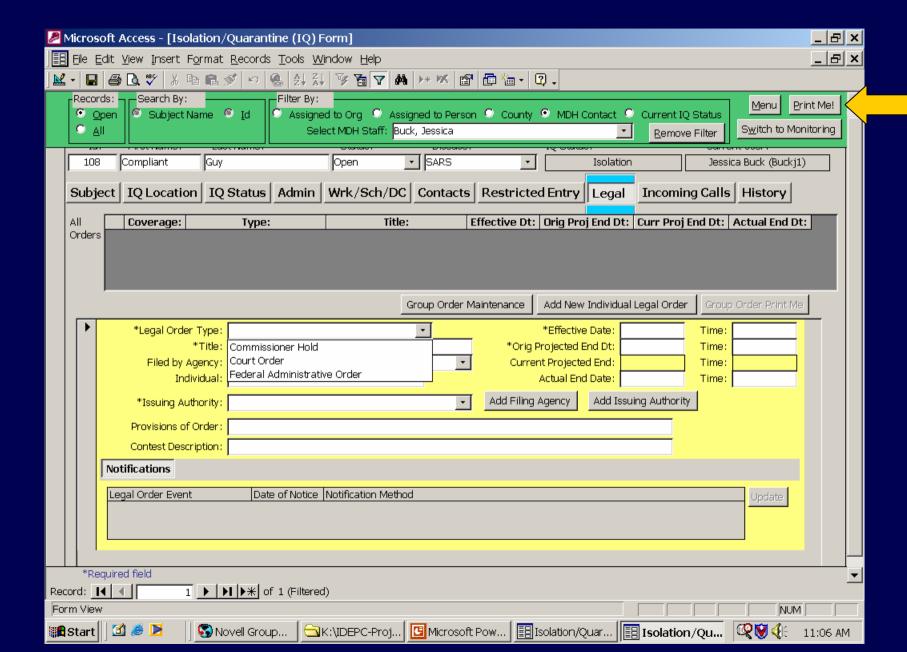
### **Day Zero Call**



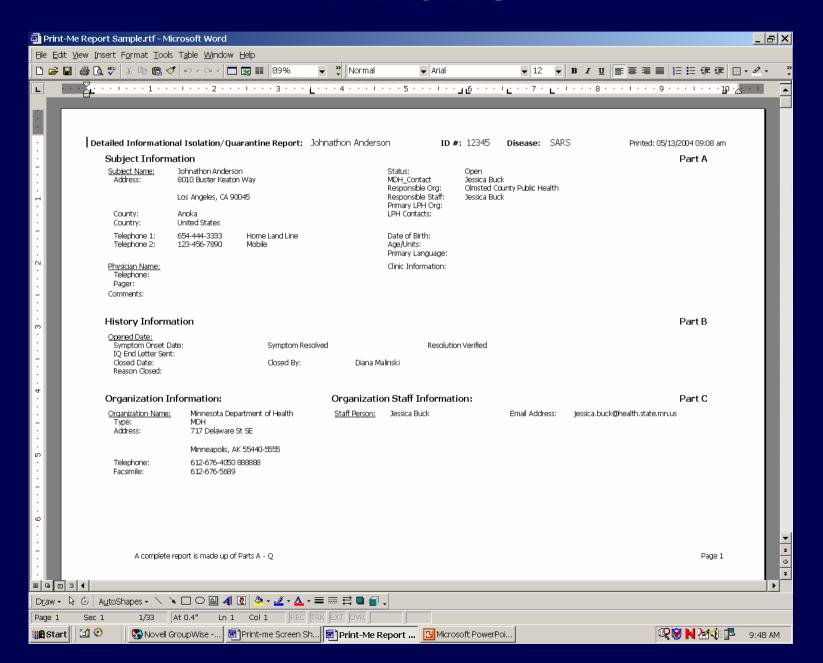
# **Incoming Calls**



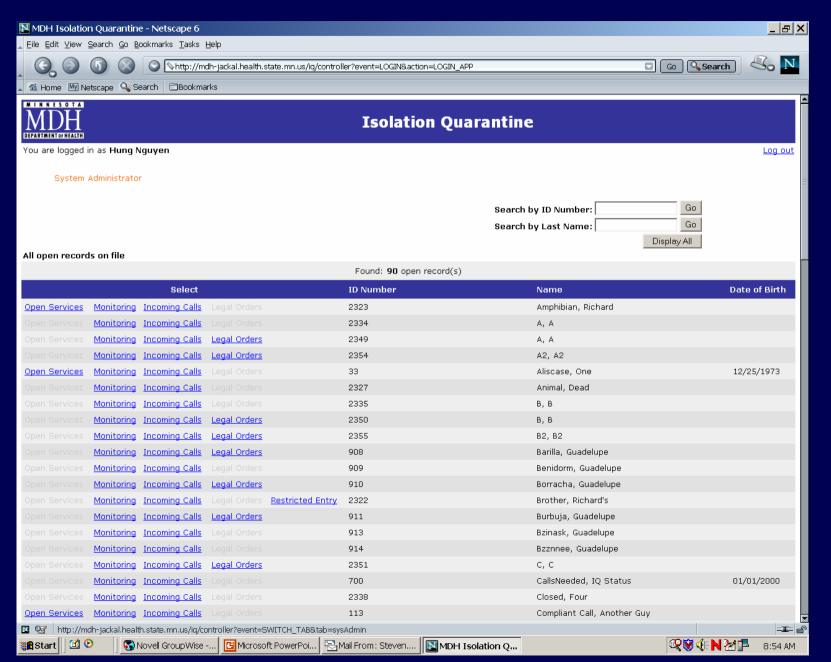
#### **Court Order**



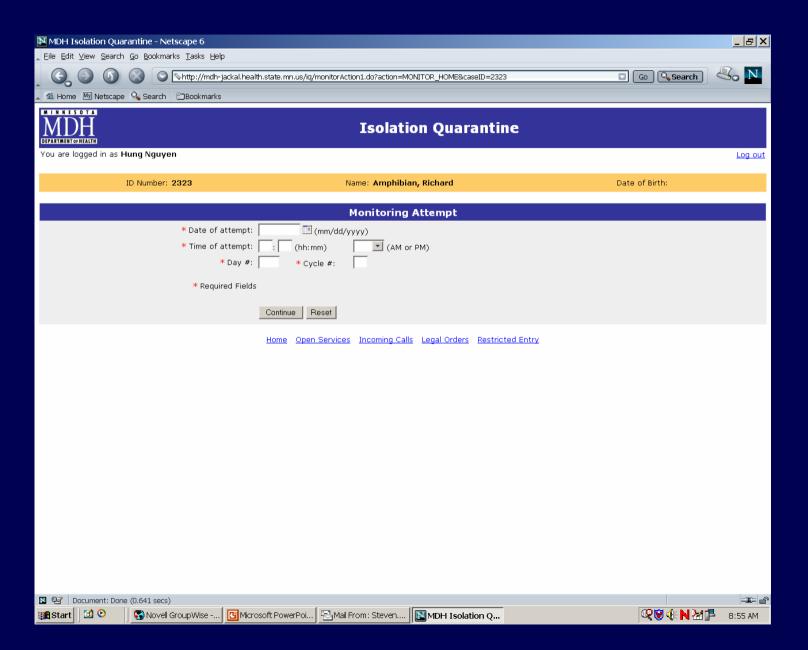
#### **Print Me**



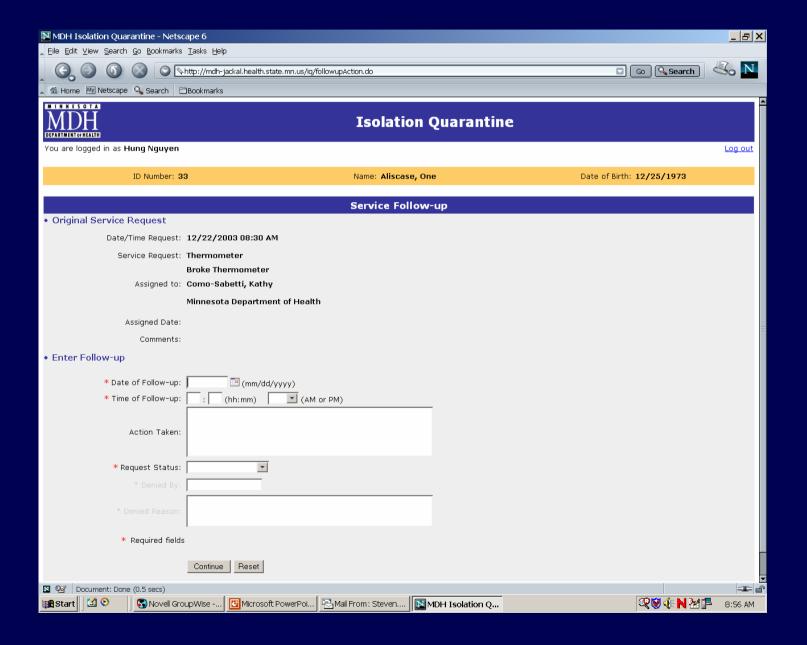
#### Web Form



# **Web Form Monitoring Attempt**



### Web Form Service Follow-up



#### Challenges

- Tight timelines
- No practical experience with large-scale isolation or quarantine
- System built on assumptions; additional need for flexibility
- Varying technical capabilities of local public health agencies

### **Challenges (cont.)**

- Funding and staff needs
  - Impact on regular tasks
- Staff pulled from multiple IT areas
- Lack of staff continuity may make updates difficult
- Funding necessary for future changes/enhancements

### Acknowledgements

- Ali Kress
- Deb Boyle
- Duy Pham
- Franci Livingston
- Hung Nguyen
- Jessica Buck
- Jim Miller
- Joe Fierst

- Kathy Como-Sabetti
- Keith Hammel
- Lynn Shellenbarger
- Mansour Hadidi
- Mark Hallock
- Steve Holm